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ABSTRACT

This study examined child developmental, program, family ecological, and demographic variables from 200 families with mentally retarded or developmentally delayed toddlers, to identify predictors of child developmental progress and parental satisfaction following participation in early intervention. Child developmental progress correlated positively with entry-point developmental age, parental expectations, quality of the home environment, and parental satisfaction, while correlating negatively with severity of delay and time spent in intervention. The best predictors of child progress were entry-point developmental age, parental expectations, and time spent in intervention. Parental satisfaction was associated positively with perception of worker competence, perceived knowledge gain, parental expectations, and current as well as entry-point child developmental age. Knowledge gain, expectations, and worker competence were the best predictors of parental satisfaction with intervention. Includes 30 references. (PB)

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# CHILD, PROGRAM, AND FAMILY ECOLOGICAL VARIABLES IN EARLY INTERVENTION

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**RUNNING HEAD: Variables in early intervention**

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## CHILD, PROGRAM, AND FAMILY ECOLOGICAL VARIABLES IN EARLY INTERVENTION


### ABSTRACT

A conceptual framework built around four broad classes of variables (child developmental, program, family ecological, and demographic) was used to identify the correlates and predictors of child developmental progress and parental satisfaction following participation in early intervention. Data were collected on 200 families with developmentally delayed children. Child developmental progress correlated positively with entry-point developmental age, parental expectations, quality of the home environment, and parental satisfaction, while correlating negatively with severity of delay and time spent in intervention. The best predictors of child progress were entry-point developmental age, parental expectations, and time spent in intervention. Parental satisfaction was associated positively with perception of worker competence, perceived knowledge gain, parental expectations, and current as well entry-point child developmental age. Knowledge gain, expectations, and worker competence were the best predictors of parental satisfaction with intervention. The implications of these results for the design and evaluation of early intervention services are discussed.



**Key Words: Early intervention; mental retardation/developmental delay; child development; program evaluation.**

## CHILD, PROGRAM, AND FAMILY ECOLOGICAL VARIABLES IN EARLY INTERVENTION

During the 20 or so years that early intervention programs for children with handicaps and developmental delays have been in existence in North America and elsewhere, one of the most persistent issues confronting professionals in the field has centered around evaluation. Evaluating an intervention program is not concerned exclusively with demonstrating whether the program works or not. However, the question as to whether early intervention works has dominated the evaluation debate, and has generated many reviews and analyses of the literature over the past two decades (e.g., Bricker, Bailey, & Bruder, 1984; Casto & Mastropieri, 1986; Denhoff, 1981; Dunst, 1985, 1986; Dunst, & Rheingrover, 1981; Gibson & Fields, 1984; Gibson & Harris, 1988; Marfo & Kysela, 1985; Simeonsson, Cooper, & Scheiner, 1982; White & Casto, 1985). Many of these reviews have identified methodological flaws which make it difficult to arrive at conclusive statements about the efficacy of early intervention (e.g., Dunst & Rheingrover, 1981; Simeonsson et al., 1982; White & Casto, 1985). Others have lamented the narrow focus on child developmental gain as the criterion for assessing efficacy, arguing that the benefits of intervention transcend gains to the child (e.g., Dunst, 1986; Marfo & Kysela, 1985). At any rate, a common thread that runs through most of the reviews, is that the efficacy of early intervention for children with handicaps and developmental delays is yet to be convincingly demonstrated.

While opponents of the early intervention movement may be tempted to draw on this literature to make a case against continued funding of intervention programs, the preceding observation does not in any way suggest that early intervention is ineffective. This observation merely reflects the complexity of the conceptual and methodological issues associated with early intervention evaluation research. At worst, the finding is more an indictment of the quality of evaluation research in the field of early intervention than of the value of early intervention per se. There is no question that evaluation researchers need to fine-tune their methodologies, if the question as to whether early intervention works is to be resolved.

However, as is now increasingly being recognized and advocated (e.g., Anastasiow, 1986; Dunst, 1986), perhaps evaluation researchers should also be asking

a slightly different type of question. Early intervention programs have become such an integral part of publicly funded human service delivery systems that the traditional efficacy question is no longer as important today as it used to be a decade ago. Of greater policy and practical importance is the question, "What mechanisms determine or influence the outcomes of early intervention?"

While this second question has been addressed to some extent through contemporary meta-analytic studies (e.g., White & Casto, 1985; Casto & Mastropieri, 1986) and traditional integrative reviews (e.g., Dunst, 1986; see also Bronfenbrenner's 1975 classic review of programs for disadvantaged preschoolers), examination of the mechanisms which influence intervention outcomes has largely been limited to variables pertaining to the intervention program itself. For example, Bronfenbrenner (1975) identified home-based programming, parent involvement, early implementation, and prolonged programming as critical correlates of efficacy in programs for disadvantaged children. The meta-analytic studies coming out of the Early Intervention Research Institute of Utah State University (White & Casto, 1985; Casto & Mastropieri, 1986) suggest that highly structured programs and highly trained intervenors are associated with greater success in programs for handicapped and at-risk children, although support was not found for the traditional belief that parental involvement and timing of intervention are critical for success.

With very few exceptions (e.g., Brassel, 1977; Bricker & Dow, 1980), evaluators of early intervention programs have generally not considered in their evaluation models nonprogram variables that may influence how much gain target children or their families derive from the intervention process. Instead, it has often been assumed that whatever changes occur in the recipients of intervention during the period of involvement are due solely to the intervention. As Dunst (1986) aptly points out, this assumption is untenable. The reality is that an intervention program is only one of many variables or support services that can impinge on child development and family functioning. Complicating the issue further is the additional reality that the welter of factors which impinge on child and family functioning often work synergistically rather than unidimensionally. Thus the quest for an understanding of the mechanisms that determine early intervention outcomes should be a search for the way and manner in which intervention program variables combine or interact with nonprogram variables to yield certain effects.

In the present study, we employed an ecological/social systems perspective to develop a model for evaluating an early intervention program which had been in operation for over 10 years. Of course, it is impossible to include in an evaluation model every variable that could conceivably mediate intervention programs and their impact on the target population. Consequently, we identified four classes of variables that years of developmental research suggest might interact in various ways not only to influence child development but also shape the manner in which an intervention program may operate for a particular family. These four classes of variables were: (1) developmental characteristics of the target child; (2) program variables; (3) family ecological variables; and (4) family demographic variables.

The choice of these four classes of variables was premised on several assumptions. First, children's developmental characteristics and/or status at the time of program entry place limits on how much developmental progress can be expected, shape parents' expectations regarding intervention outcomes for the child, and may influence how much commitment parents make to the intervention process. Second, parental commitment to the intervention process is influenced as much by factors external to the intervention program as it is by factors related to the program. For example, parents' beliefs about child development as well as their expectations about their child's future may be as instrumental in determining parents' interest in and commitment to program activities as their perceptions about the quality of programming and staff expertise. Third, the amount and quality of developmentally enhancing environments and experiences to which parents expose their children outside the intervention context are crucial ingredients of developmental progress; however, these attributes may themselves be influenced or shaped by participation in the intervention program, by belief systems and/or expectations, and by such demographic variables as level of education and family income.

Understanding these various sources of inter-subject variation and how they are related to intervention outcomes should help strengthen the knowledge base that is needed to raise the awareness of interventionists and policy makers about the importance of aligning expectations regarding intervention inputs and outcomes with the unique developmental, ecological, and demographic realities of target populations. Over twenty

years ago, Kiesler (1966) described three sets of myths in psychotherapy research. One of these sets included what he referred to as the "uniformity assumption myths." Prominent among the uniformity assumption myths were the assumptions that (1) clients enter (or can be selected to enter) intervention or therapy with the same characteristics, and (2) different intervenors or therapists functioning in the same program implement intervention activities in the same way. Dunst (1986) has addressed another myth which can safely be grouped with Kiesler's uniformity myths, namely that early intervention has homogenous effects.

Everything we know from years of psychological and sociological research goes against these myths; yet these myths are still alive in early intervention evaluation research, especially in experimentally controlled efficacy research. Because the recipents of intervention come from varying backgrounds and receive services that are often individualized (or at least intended to be so), intervention cannot be expected to have a uniform impact across clients. For this reason, early intervention evaluation research must not be limited to the use of between-group designs for the exclusive purpose of ascertaining whether the intervention works or not. Evaluation research must also seek to identify, in the broadest terms possible, the program and extra-program correlates or determinants of program outcomes. The present study was designed as a modest effort in this direction.

The principal objectives of the study were three-fold: (1) to ascertain how much developmental progress was made by the children during the period of their participation in the program; (2) to identify the child, program, family ecological, and demographic factors associated with such progress, and (3) to identify the determinants of parental satisfaction with the intervention process and its outcomes.

## METHOD

### Subjects

The subjects in this study were families of infants and young children with varying degrees of mental retardation or developmental delay receiving early intervention services through the Direct Home Services Program (DHSP). Established in 1975 and funded completely by the Newfoundland and Labrador (Canada) Provincial Department of Social

Services, DHSP is a home-based program patterned after the orginal Portage Model (Shearer & Shearer, 1976). Child Management Specialists with undergraduate degrees in psychology or related fields are trained to make weekly home visits to work directly with children as well as train parents to teach their own child in five developmental domains: preacademic, communication, social, self help, and motor. Each worker usually has a caseload of 13 families.

A total of 280 families were contacted and requested to participate in the study. Of this number, 263 families completed and returned at least some of our instruments, yielding a return rate of 94%. However, 63 returns (24%) were deemed too incomplete to be included in data analyses. The 200 families included in the analyses consisted of 132 active participants (66%) and 68 graduated recipients (34%).

The final study sample included 138 married, 20 single, and 9 divorced or separated parents. Information on marital status was not disclosed by 33 of the parents. Additional information on family and child characteristics are presented in Table 1. Four dimensions of family demography -- age, educational background, family income, and size of community of residence -- are presented in the table. Reported incomes were relatively low, with as much as 56.5 % of the sample earning below $15,000.00 a year. These income levels should, however, be viewed in relation to the relatively rural nature of the sample, and to the reported educational backgrounds (as much as 76.2 of mothers and 63.3% of fathers had only up to high school education).

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Insert Table 1 About Here

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The mean CA of the children corresponding to the dates on which the latest assessment data were taken was 51.3 months (SD=18.3). The average length of time spent in intervention was 21.5 months (SD=15.6), and the sex ratio for the children was 59% boys and 41% girls. For the vast majority of children (70%), the clinical label available from program records was developmental delay (DD) of unspecified origin. Of the more defined and specific conditions, Down syndrome (12%), cerebral palsy (7%), and spina bifida (7%) were the most prevalent in the sample.

**Measures and Procedures**

Beside the demographic data in Table 1 (family income, parents' education, and parents' age), several instruments were employed to obtain three additional classes of measures: child developmental measures; early intervention program measures; and family ecological measures.

Child developmental measures:

Alpern-Boll Developmental Profile (Alpern & Boll, 1972) data available through program records were used to derive a number of developmental indices: overall developmental age at the time of program entry ($DA_1$); severity of developmental delay index (SDDI); current developmental age ($DA_2$), relative developmental gain (RDG), and a change in rate of development (CRD) index. The main Severity of Developmental Delay Index (SDDI) was based on the entry-point Alpern-Boll scores and was computed as as:

$$[(CA_1 - DA_1) / CA_1].$$

A second index of degree of delay was obtained by asking parents to rate the severity of their child's delay/handicap on a 4-point scale. Ratings ranged from mildly delayed (1) to profoundly delayed (4). The two SSDIs were significantly correlated ($r = .37$; $p < .001$).

RDG indexed the rate of developmental progress relative to length of time spent in intervention, and was computed as:

$$[(DA_2 - DA_1) / (CA_2 - CA_1)].$$

The RDG index in the present study is similar to Bagnato and Neisworth's (1980) Intervention Efficiency Index (IEI). We have chosen not to use the label IEI only because we do not agree with the connotation that the measured developmental gain results directly from the intervention process. In all analyses involving child developmental progress, RDG was the index used. However, we were also cognizant that the first step to addressing the efficacy issue is to determine the extent to which the rate of development during the intervention period significantly exceeded the pre-intervention rate of development. In this regard, we agreed with Dunst (1986) that it is necessary to employ an index that makes it possible to assess the presumed intervention-induced rate of development in relation to the rate of development prior to intervention. The CRD index (see also Rosenberg, Robinson, Finkler, & Rose, 1987; Wolery, 1983), used for this

purpose, was obtained by dividing the RDG above by the pre-program rate of development. It was expressed as:

$$\frac{[(DA_2 - DA_1) / (CA_2 - CA_1)]}{[DA_1 / CA_1]}$$

Program Measures:

The first program variable in the study was time spent in intervention. Three additional program measures were derived from a Parent Evaluation Questionnaire (PEQ) designed specifically to evaluate the intervention program from the perspective of the participating parents. The PEQ had several sections, three of which are pertinent to the analysis reported in this paper.

Satisfaction with the program: Twelve items on the PEQ requested parents to rate their satisfaction (1) with programming in each of the five developmental domains covered by the program (academic, language, social, motor, and self help), (2) with the progress their child had made in each domain, (3) with the methods of intervention employed by program staff, and (4) with the overall gains made by the child. Reliability analysis[1] of the 12-item satisfaction scale produced a total scale alpha of .89, with corrected item-total scale correlations ranging from .42 to .70.

Knowledge gain: The extent of knowledge gained by parents through their participation in the intervention program was assessed through 16 items on the PEQ. On a 5-point scale, ranging from "gained nothing" to "now an expert," parents rated how much they had learned in such areas as: assessment and evaluation of the child; behavior management techniques; recording child progress; understanding and appreciating the child's abilities and needs; skills for coping with the child's problem; selecting appropriate toys and materials; parental rights; other support services within the community, etc. Reliability analysis of the entire 16-item scale produced a Cronbach's alpha of .94, with corrected item-total scale correlation coefficients ranging from .60 to .80.

Worker competence: Parental perception of the intervention worker's professional

[1]All reliability analyses of the PEQ and the Child Expectations scales were carried out prior to the main data analyses. The sample sizes for all analyses ranged from 114 to 166.

competence and interpersonal skills was assessed through 8 items on the PEQ. On a 5-point scale, ranging from "inadequate" to "excellent," parents rated their intervention worker on the following: ability in explaining the child's program to the parent; sensitivity to the parent's needs; knowledge and skill in child management techniques; success in building a good relationship with the child; ability to deal with problems and questions with which parent needs help; regard for parental opinions and input into the child's program; extent to which parental suggestions and input are acted upon; attitude toward the parent during visits. The reliability coefficient for this scale was .91, with corrected item-total scale correlations ranging from .68 to .78.

The PEQ was mailed to all parents with a stamped return envelope. An accompanying letter requested parents to assist in evaluating the effectiveness of the program to enable program staff to provide the best service possible to all families. Parents were requested to be as frank in their responses as possible, and were assured that no child or family names would be used in storing information and that all responses to the questionnaire would be analyzed only at the level of the entire group of participating parents.

Family Ecological Measures

Three weeks after mailing the PEQ, several other instruments, selected to assess various dimensions of family ecology, were sent to parents through the intervention workers. These included:

1. the Child Expectations Scale, originally developed by Dunst and his associates at the Western Carolina Center and revised by our research team;
2. the Family Resources Scale (Leet & Dunst, 1985); and
3. the Home Screening Questionnaire (Coons, Gay, Fandal, Ker, & Frankenburg, 1981).

On these other instruments, the intervention workers were instructed to provide assistance to parents who needed help with interpretation of items. They could, however, not assist parents with the actual selection of responses to items. Each of the instruments is described briefly below.

Child Expectations Scale (CES): The CES is a 10-item multiple-choice scale

designed to assess expectations that parents hold regarding the future of their handicapped children in the domains of schooling, physical and financial independence, socialization and community involvement, and living and working environments. Within-item response alternatives are ordered from low to high expectations. A composite score was derived from 9 items on the scale that had hierarchically ordered responses. Weights were applied in a manner that resulted in higher scores for parents with higher expectations. Possible scores ranged from 9 to 37. Following reliability analysis, however, one item pertaining to expectations about where the child would live as a teenager was dropped from the scale because of its low correlation with the total scale. The standardized item alpha for the remaining 8-item scale was .90, with item-total scale correlations ranging from .56 to .83.

Family Resources Scale (FRS): The FRS is a 5-point scale used to assess the adequacy of a variety of resources available to households with young chilren. The original instrument (Leet & Dunst, 1985) contained 30 items rank-ordered from the most to least basic and was based on the conceptual premise that the adequacy of resources necessary to meet basic needs would bear a direct relationship not only to family well-being but also to parental commitment to early intervention-related activities. Reliability and validity data on the FRS have been reported in Leet and Dunst (1985). To render the scale appropriate for use with our Newfoundland sample, 10 of the original items considered socially and culturally inappropriate or too sensitive to elicit reasonably accurate responses were dropped, resulting in a 20-item scale. However, the original most-to-least basic order was preserved.

Following reliability analysis, six items which correlated poorly with the total scale were deleted, resulting in a 14-item scale covering the following resources: time to get enough sleep or rest; time to be by self; time for family to be together; time to be with spouse or close friend; babysitting or day care for children; money to buy special equipment or supplies for children; someone to talk to; time to socialize; time to keep in shape and look nice; money to buy toys for the children; money to buy things for self; money for family entertainment; money to save; and vacation. Mothers rated the adequacy of each of those resources, except those considered not applicable to their situation. The reliability of the new 14-item scale was .89, with corrected item-total scale

correlation coefficients ranging from .42 to .72.

Home Screening Questionnaire (HSQ): The quality of the child's early environment has long been acknowledged as a critical factor in development. The need to include assessments of the child's home environment in implementing and evaluating intervention programs has been recognized for many years, although very few tools exist for this purpose.

Developed for use by health professionals and educators directly involved in promoting child health and development, the HSQ measures the quality of children's home environment. It was designed along the lines of the more well-known Home Observation for Measurement of the Environment (HOME) inventory (Caldwell & Bradley, 1978), using a questionnaire format. Unlike the HOME, the HSQ is completed directly by the parent. A variety of response formats is employed: multiple choice; fill-in-the blank; and "yes/no" options. Two separate forms are available for use with children 0-3 and 3-6 years old, respectively, each with a toy checklist at the end of the instrument.

Items on the HSQ cover a wide range of factors that have the potential to influence child development: availability of materials like books and toys; how often the child is read to; extent of parental involvement in the child's play; the amount of time the child spends with adults other than the primary caregiver; opportunities to interact with other children; opportunities for exploration both within and outside the home; verbal stimulation in a variety of contexts; and exposure to experiences such as outing (e.g., going shopping with parents or other adults), television, pets, and a variety of household items. Validation data on the HSQ have been reported by Coons and her associates (Coons et al., 1981).

## RESULTS

The means and standard deviations of all the child, program, and family ecological variables are reported in Table 2.

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Insert Table 2 About Here

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**Intercorrelations within and between classes of variables**

Program variables: The three main program variables (parental satisfaction, knowledge gain, and worker competence) correlated significantly with one another. Parents who expressed stronger satisfaction with the program reported greater knowledge gain ($r = .49$, $p < .001$) and rated their worker higher on the competence scale ($r = .42$, $p < .001$). Also parents who rated their worker higher reported greater knowledge gain ($r = .40$, $p < .001$). Time spent in intervention was not related to either parental satisfaction or worker competence rating; however, parents who had been in the program longer tended to report greater knowledge gain ($r = .17$, $p < .05$). Satisfaction, knowledge gain, and perception of worker competence were not related in any way to demographic variables like family income, parental age, or parental education. However, it was significantly correlated with parental expectations ($r = .39$; $p < .001$) and quality of the home environment ($r = .23$; $p < .01$).

Ecological variables: Two of the three intercorrelations among the ecological variables were significant. Parental expectations regarding the child's future correlated significantly with the quality of the home environment ($r = .32$, $p < .000$) and with the quality of resources available to the family ($r = .43$, $p < .000$). The relationship between family resources and quality of the home environment was not significant. Both family resources and quality of the home environment were related significantly with family income and parental education; the quality of the child's home environment was better in families with higher family income ($r = .27$, $p < .01$) and higher maternal ($r = .24$, $p < .01$) and paternal ($r = .24$, $p < .01$) level of education. Similarly, parents reporting greater resources came from families in which family income ($r = .48$, $p < .001$), paternal education ($r = .25$, $p < .01$), and maternal education ($r = .15$, $p < .05$) were higher.

**Child developmental progress over the course of intervention**

We examined the degree of change occurring in children's rate of development following participation in the intervention program. For each developmental domain and for overall development, Table 3 reports the pre-program rate of development (column 1), developmental gain per time in intervention (RDG, column 2), and the corresponding post-program change in rate of development (CRD, column 3). The data in Table 3 show the

following:

Insert Table 3 About Here

1. that the pre-program rate of development among the children was about 63% of normal rate of development (i.e., assuming the normal rate to be one month of development for every chronological month);
2. that the rate of development per month, over the intervention period, was .82 months per month of chronological growth;
3. that the rate of development after 21 months of intervention was about one and one-half times the pre-program rate.

Although no comparable data are available from previous studies, the developmental rate change reported here indicates that on the average children made substantial developmental progress during the program period. Subsequent analysis were performed to identify the correlates and potential predictors of such progress.

Correlates of child developmental progress

Table 4 reports the correlations between the two major dependent variables of interest (child progress and parental satisfaction) and each of the four classes of variables. Of the four broad classes, demography (family income, parental education, and parental age) was the only class that was unrelated to child developmental gain. The child developmental variables associated with developmental progress were entry-point developmental level ($r = .54$, $p < .001$), entry-point chronological age ($r = .34$, $p < .001$), and severity of delay -- as indexed through Alpern-Boll scores ($r = -.29$, $p < .001$) and as rated by parents ($r = -.30$, $p < .001$). Thus, children who were functioning at a higher level of development or were less severely delayed at the time of entering the program made more progress. The correlation between entry-point CA and developmental progress may be an artifact of the usual CA-DA relationship, and should perhaps not be intepreted as an indication that late entry into intervention was associated with greater progress.

Insert Table 4 About Here

Developmental progress was also associated with two ecological variables; children making greater gains had parents with higher expectations ($r = .40$, $p < .001$) and came from better quality home environments ($r = .30$, $p < .001$). Finally, two intervention program variables were related to developmental gain. Children whose parents expressed greater satisfaction with the program made greater gains ($r = .20$, $p < .01$); surprisingly, however, developmental gain appeared to decline as children stayed longer in the program ($r = -.40$, $p < .001$). Even after controlling for the effect of severity of delay, the semi-partial correlation between time spent in intervention and relative developmental gain was still negative and highly significant ($r_{G(T.S)} = -.38$; $p < .001$)[2]. This latter finding is examined at length in the discussion section.

Predictors of child developmental progress

The relationships described above between child developmental gain and the various child, program, and ecological variables were interpreted as being consistent with our conceptual position that the value and outcomes of early intervention must be viewed in relation to a complex variety of interacting forces. To further ascertain the extent to which variables from the three broad classes (child, program, and family ecological) work synergistically to influence developmental gain, we performed a step-wise regression analysis, with relative developmental gain as the dependent variable. The demographic variables were excluded from the analyses because of the fact that they did not correlate with many of the other variables in the study.

Three child developmental variables (severity of delay, entry-point CA, and entry-point DA), two program variables (time in intervention and parental satisfaction), and two ecological variables (expectations and quality of the home environment) were entered into the analysis as the independent variables. Table 5 displays the results of the analysis. The best predictors of child developmental progress were entry-point developmental age, parental expectations, and time in intervention (negative sign). The three variables -- one from each of the three broad classes of variables -- together explained 37% of the variance.

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[2] G = Developmental gain; T = Time in intervention; S = Severity of delay.

Insert Table 5 About Here

**Parental satisfaction with the intervention process and its outcomes**

Generally, parents expressed a high degree of satisfaction with the content and effects of the program (mean rating=4.06; SD=0.61). Analysis of responses on the satisfaction scale revealed that while parents were as pleased with programming in the academic/cognitive domain as they were with the other four domains, they showed noticeably less satisfaction with actual child developmental gain in the academic/cognitive domain (mean rating=3.88) than they did with gains in all other domains (mean ratings for satisfaction with gains in the other domains ranged from 4.00 to 4.20).

Correlates of parental satisfaction with the program

Again, demography (family income, parental education, and parental age) was the only class of variables that was completely unrelated to this variable. Satisfaction correlated significantly with all the child developmental variables. Generally parents of higher functioning children as well as parents of children who made greater developmental progress expressed greater satisfaction with the program.

In terms of the ecological variables, parents who held higher expectations about their child's future and those exposing their children to a better quality environment reported greater satisfaction with the program. Satisfaction was also associated with two of the four program variables; parents reporting greater knowledge gain from their participation in the program and those who held a higher perception of the worker's ability expressed greater satisfaction.

Predictors of parental satisfaction

A second step-wise multiple regression analysis was performed to ascertain the extent to which variables from the three broad classes (child, program, and family ecological) worked independently or combined to influence parental satisfaction with the program. Again, the demographic variables were excluded from the analyses because of the absence of any meaningful zero-order correlations. Three child developmental

variables (severity of delay[3], as rated by the parent; entry-point developmental age, and developmental progress), two program variables (knowledge gain and perception of worker competence), and two ecological variables (expectations and quality of the home environment) were entered into the analysis as the predictor variables. The results of this analysis are also displayed in Table 5. Two program variables (knowledge gain and perception of worker competence) and one ecological variable (parental expectations) were found to be the best predictors of parental satisfaction with the intervention. The three variables together accounted for 36% of the variance.

## DISCUSSION

This study attempted to assess how much change occurred in children's development during the course of participation in an early intervention program, and to ascertain the extent to which observed gains were associated with individual differences on a variety of child, program, family ecological, and family demographic variables. The study also sought to assess parental perceptions about the program's value, with particular emphasis on identification of the correlates and predictors of parental satisfaction with the intervention and its impact on the child.

Employing an index of change in the rate of development (see Dunst, 1986; Rosenberg et al., 1987; Wolery, 1983), it was established that over the intervention period children's overall development was facilitated by as much as 1.5 times the pre-intervention rate of development. While this rate change is substantial and perhaps attests to the efficacy of the intervention, it will be misleading to attribute all the change to the early intervention process alone. The conceptual framework adopted in this study was one which treated early intervention as one of many influences on children's development. Consequently, subsequent analyses were aimed at identifying the variety of variables -- program as well as non-program -- which may have contributed to children's developmental progress during the period of intervention.

Child developmental gain was associated positively with entry-point developmental age, parental satisfaction with the intervention, parental expectations regarding the child's

[3]Recall that two measures of severity of delay were used, one based on actual developmental assessment and the other based on parental ratings of their child's degree of handicap. The latter was used in this second regression analysis.

future, and quality of the home environment; however, developmental gain was associated negatively with time spent in intervention. The best predictors of developmental gain were entry-point developmental age, parental expectations, and time in intervention (negative sign).

Our finding that entry-point developmental competence was a strong predictor of child progress is consistent with findings reported in several earlier studies. Two studies which also employed regression techniques to examine the combined influences of program and nonprogram factors on child developmental progress (Brassel, 1977; Bricker & Dow, 1980) found entry-point developmental status to be predictive of child progress. More recently, in a regression analysis involving some 167 preschoolers receiving intervention in 36 counties, Mastropieri (1987) found the strongest predictor of post-intervention mental ability (as measured on the Bayley Scales) to be the pretest MDI scores. A fourth study which did not utilize the regression technique (Barna, Bidder, Gray, Clements, & Gardner, 1980) also found that more severely handicapped children made the least developmental gain. These results underscore the need for parents and interventionists alike to be realistic in their expectations of early intervention outcomes for more severely delayed children. Paradoxically, while these children have a greater need for intervention, they also appear to profit the least from it (Bailey & Simeonsson, 1988).

While child developmental progress was not related to traditional socioeconomic status variables like family income and parental education, it was strongly related to a measure of the quality of the child's home enviroment. Our results seem to suggest that beyond the constraints that the child's level of competence at program entry places on developmental outcome, ecological variables like parental expectations and the quality of the child's home environment are powerful mediator variables that need to be given serious consideration in the design, delivery, and evaluation of programs.

The significant negative correlation between time in intervention and relative developmental gain (even after partialling out the effect of severity of delay) is a striking finding because it appears counter to conventional wisdom, which would seem to predict maximization of developmental progress as a function of prolonged participation. While our results seemingly suggest poorer outcomes for longer-term recipients of intervention, such an interpretation is perhaps simplistic and misleading. A more reasonable

interpretation appears to be that developmental gain was greater at the earlier stages of involvement than it was at the later stages. Interpreted this way, the finding appears to be consistent with what one would theoretically expect. That is, there is more room to demonstrate the impact of intervention in the absence of prior programming than there is when intervention already exists and has begun to make its impact on child developmental competence. To further illustrate this point, let us consider the goal of intervention, relative to the child's development. Essentially, the goal is to close the gap between the current level of development and the potential level of developmental competence under optimal environmental and experiential input.

If we called this gap the zone of maximum potential developmental gain (MPG), we will theoretically expect this zone to diminish as intervention progresses. If environmental and experiential input in the form of therapeutic developmental intervention has a potentially powerful influence on the development of young handicapped children, and if such intervention does actually result in a significant reduction in MPG when first introduced, then subsequent progress is bound to be relatively minimal. Such a scenario does not suggest a diminishing of the potency of intervention; rather it reflects a ceiling effect on the gain index. Our interpretation of this negative correlation, then, is that child developmental gain was, as should be expected, generally greater at the earlier stages of involvement than at later stages. Given this interpretation, the results of the regression analysis suggested that children making the greatest gains were those who were developmentally higher functioning prior to entering intervention, whose parents held higher expectations, and who were at the initial stages of program involvement.

Of course, other equally plausible explanations of the inverse relation between time in intervention and developmental gain can be entertained. For example, deficiencies in the Alpern-Boll Developmental Profile, such as lack of sensitivity to developmental change at the older ages, could be implicated. The relatively inferior psychometric qualities of the Alpern-Boll would seem to make this explanation a rather appealing one; however, we would submit that under the theoretical explanation offered above, studies employing developmental measures with superior psychometric qualities are likely to replicate our finding. Indeed, partial corroboration of our results has been found in two recent studies (Mastropieri, 1987; Mastropieri & Scruggs, in press). Both studies reported significant

negative correlations between length of time in intervention and post-test MDI scores. It must be noted, however, that while these two latter studies examined time in intervention in relation to straight post-test scores, our study examined length of participation in relation to a relative developmental gain index derived as the ratio of the difference between pre- and post-test scores to length of participation.

From a programming perspective this finding could conceivably also be interpreted as follows: that the intervention activities were best suited to younger and/or beginning recipients, such that the program became less responsive to the developmental needs of children beyond either a certain level of developmental competence or a certain stage of involvement with programming. If this is the case, the implication for programming is clearly the need for ongoing monitoring and critical examination of program content/activities and instructional strategies in order to ascertain the extent to which they remain developmentally appropriate, challenging, or enhancing for the entire range of ages covered by the program.

Of equal interest was the finding that parental satisfaction with intervention was associated with child, program, and family ecological variables. Parents reporting stronger satisfaction with the program were those whose children were more developmentally competent, those who reported greater knowledge gain from involvement in the program, those who held greater confidence in their worker's competence, those who held higher expecatations about their child's future, and those who provided a higher quality home environment to their children. It is significant that of the three predictors of parental satisfaction (knowledge gain, expectations, and perception of worker competence), two were program-related.

Parental expectations regarding the child's future emerged as a critical mediator variable in this study, the only variable to predict both child developmental progress and parental satisfaction. This finding confirmed our initial conceptualization that early intervention programs make their impact via, and in interaction with, a variety of nonprogram factors. What then is the mechanism by which parental expectations play such a central role in the intervention process? There was a very strong relationship between parental expectations and both entry-point ($r = .33$; $p < .001$) and current ($r = .51$; $p < .001$) developmental age. It appears that parents construct their expectations based,

at least in part, on their child's level of competence. These expectations then shape the nature and extent of their commitment to the intervention process, while also influencing the amount and quality of other environmental inputs that they provide for their child in the home independently of the intervention program. These various forces ultimately interact with actual programming activity and idiosyncratic developmental potential to determine how much progress each child manifests over the course of intervention.

To conclude on a cautionary note, the fact that the predictors of child developmental progress and parental satisfaction in the present study explained less than 40% of the variance in each case, suggests the need for more exhaustive models in future research. Nevertheless, the modest confirmation that child, program, and family ecological variables combine to produce the best developmental outcomes and determine how much satisfaction parents derive from their involvement underscores the utility of conceptualizing and evaluating early intervention programs from a broader ecological or social systems (Dunst & Trivette, 1988) perspective.

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Table 1. Family Demographic Characteristics

MEAN AGES IN YEARS

| | Mean | S.D. |
|---|---|---|
| Mothers (n=150) | 31.8 | 7.2 |
| Fathers (n=137) | 34.8 | 7.7 |

EDUCATION

| | % of Mothers (n=163) | % of Fathers (=149) |
|---|---|---|
| Grade school | 29.4 | 27.5 |
| High school | 47.2 | 35.8 |
| Vocational training | 14.7 | 22.8 |
| University: undergraduate | 6.1 | 9.4 |
| University: post graduate | 2.5 | 4.7 |

| FAMILY INCOME (Thousands of dollars)* | (n=154) |
|---|---|
| 10 or less | 37.0% |
| 10 - 15 | 19.5% |
| 15 - 25 | 22.7% |
| 25 - 40 | 13.6% |
| Above 40 | 7.1% |

| SIZE OF COMMUNITY BY POPULATION | (n=158) |
|---|---|
| Up to 5,000 | 64.6% |
| 5 to 15,000 | 16.5% |
| 15 to 30,000 | 4.4% |
| 30 to 125,000 | 14.6% |

*Data received from the Provincial Statistics Agency indicate that the mean and median census family incomes for the Province in 1986 were $27,687.00 and $23,756.00, respectively.

Table 2. Means and Standard Deviations for Child, Program, and Family Ecological Variables

| Variable[a] | Mean | SD |
|---|---|---|
| **Child Variables** | | |
| Entry-level CA | 30.42 | 18.92 |
| Current CA | 51.34 | 18.26 |
| Entry-level DA | 18.44 | 14.31 |
| Current DA | 31.96 | 17.66 |
| DDSI | 0.37 | 0.29 |
| **Program Variables** | | |
| Time spent in intervention | 21.45 | 15.59 |
| Parental satisfaction[b] | 4.06 | 0.61 |
| Parental knowledge gain[b] | 3.44 | 0.72 |
| Perceived worker competence[b] | 4.53 | 0.50 |
| **Family Ecological Variables** | | |
| Parental expectations | 28.68 | 7.13 |
| Quality of the home environment | 35.25 | 8.33 |
| Family resources[b] | 3.21 | 0.88 |

CA = Chronological age; DA = Developmental age, based on all 5 subscales.
[a]Valid sample sizes for all variables ranged from 182 to 199.
[b]Scores are based on 5-point rating scales

Table 3. Preprogam Rate of Development (PRD), Relative Developmental Gain (RDG), and Change in Rate of Development (CRD) Indices by Domain.

| | 1<br>PRD<br>Mean (SD) | 2<br>RDG<br>Mean (SD) | 3<br>CRD<br>Mean (SD) |
|---|---|---|---|
| Motor skills | .549 (.32) | .748 ( .74) | 1.612 (2.57) |
| Self-help skills | .666 (.36) | .896 (1.00) | 1.496 (1.64) |
| Social skills | .686 (.35) | .759 ( .84) | 1.327 (1.49) |
| Academic/cognitive skills | .685 (.34) | .941 ( .99) | 1.631 (2.09) |
| Communication skills | .577 (.32) | .788 ( .87) | 1.665 (2.41) |
| **Overall developmemt** | **.633 (.29)** | **.815 ( .67)** | **1.509 (1.27)** |

Table 4. Relationship of Child Developmental Progress and Parental Satisfaction to Child, Program, Family Ecological, and Demographic Variables.

| | Relative Developmental Progress. | Satisfaction with Program |
|---|---|---|
| **Child Variables** | | |
| Entry-level CA | .34*** | |
| Entry-level DA | .54*** | .24** |
| Current DA | .66*** | .37*** |
| Severity of delay | .29*** | .32*** |
| **Program Variables** | | |
| Time in intervention | .40*** | |
| Satisfaction with program | .20* | |
| Worker competence | | .42*** |
| Knowledge gain | | .49*** |
| **Family Ecological Variables** | | |
| Expectations | .44*** | .39*** |
| Home environment | .30*** | .23** |
| Family resources | | |
| **Demographic Variables** | | |
| Income | | |
| Mother's education | | |
| Father's education | | |
| Mother's age | | |
| Father's age | | |

Underlined correlation coefficients are negative in sign.
CA = Chronological age; DA = Developmental age
** $p < .01$ *** $p < .001$

Table 5. Predictors of Child Developmental Progress and Parent Satisfaction

| Dependent Variable | Independent Variables | b | SE(b) | BETA | F |
|---|---|---|---|---|---|
| **Child Progress** | | | | | |
| | Entry-point DA | .020 | .004 | .421 | 5.248*** |
| | Expectations | .035 | .009 | .310 | 3.885*** |
| | Time in program | -.009 | .003 | .206 | -2.464* |
| | Constant | -.152 | | | |
| | Multiple R | .621 | | | |
| | $R^2$ | .386 | | | |
| | Adjusted $R^2$ | .371 | | | |
| **Satisfaction** | | | | | |
| | Knowledge gain | .205 | .063 | .286 | 3.264** |
| | Expectations | .026 | .006 | .339 | 4.380*** |
| | Worker competence | .270 | .086 | .270 | 3.145** |
| | Constant | 1.495 | | | |
| | Multiple R | .612 | | | |
| | $R^2$ | .375 | | | |
| | Adjusted $R^2$ | .358 | | | |

* $p<.05$; ** $p<.01$; *** $p<.001$